Assistant Commissioner for Patents
Box: CPA
Washington, D.C.   20231

Date: October 19, 1999
Docket No. Y0996-244X
First inventor: H. W. Adams
Prior Art Unit: 3712
Prior Ex.   J. Rovnak

Sir:

This is a request for filing a [X] continuation [ ] divisional
[ ] continuation-in-part under 37 C.F.R. **1.53(b)** of pending prior application
Serial No. 08/877,912 filed on June 10, 1997 of _H.W. Adams, et al._ for
SYSTEM AND METHOD FOR INTERACTIVE READING AND LANGUAGE INSTRUCTION.

1.   [ ] As last amended, the title has been changed to _____
_____.

2.   [ ] As last amended, the name of applicant has been changed to
_____.

3.   [X] Enclosed is [X] a copy of the oath or declaration as filed in the
prior application or [ ] a new oath or declaration.

4.   [X] The filing fee is calculated below:

Claims as filed in this application	Number Filed		Number Extra	Rate	$	Basic Fee
						760.00
Total Claims	45- 20	=	25	X $18	=	450.00
Independent Claims	8- 3	=	5	X $78	=	390.00
Multiple Dependent Claims, if any ($260)					=	
Total Filing Fee --------------------------------------					$	1600.00

5.   [X] Charge any fees which may be required, except for the Issue
Fee, or credit any overpayment to Deposit Account No. 50-0510.

6.   [X] Cancel in this application original Claims 10, 15, 20, 24 and 37 of the
prior application before calculating the filing fee.

7.   [X] Amend the specification by inserting before the first line the
sentence: - This is a [X] continuation [ ] division
[ ] continuation-in-part of application Serial No. 08/877,912,
filed June 10, 1997.

8.   [ ] Priority of application Serial No. _____ ,filed on
_____ in _____ is claimed under 35
U.S.C. 119.

9.   [ ] The certified copy of the priority application has been filed
in prior application Serial No. _____, filed
_____.

10. [ ] An appointment of associates is enclosed.
11. [X] Address all future communications to _Anne Vachon Dougherty._
3173 Cedar Road, Yorktown Heights, N.Y. 10598.
12. [X] A preliminary amendment to this application is enclosed.
13. [ ] Enter in this application the amendment under 37 C.F.R. 1.116
which was unentered in the prior application.

for IBM Corporation
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of   :   October 19, 1999

H.W. ADAMS, ET AL   Group Art No.: 3712

Serial No.: to be assigned,
  continuation of 08/877,912   Examiner: J. Rovnak

Filed: October 19, 1999   Anne Vachon Dougherty
                                          3173 Cedar Road
Title: SYSTEM AND METHOD FOR   Yorktown Hts, NY
    INTERACTIVE READING   10598
  AND LANGUAGE INSTRUCTION

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified patent application, please enter the following amendments. The amendments and remarks respond to issues raised in the Final Office Action dated June 21, 1999 for the parent application, Serial No: 08/887,912.

YO996-244X   -1-

I N THE CLAIMS:

Cancel Claims 10, 15, 20, 24, 37 and 41.

Add Claims 44-51.

Amend Claims 1, 7, 9, 21, 25, 26, 29, 31-33, 40, and 42 as follows:

1. (Amended) A computer-based learning system for providing an interactive lesson between the computer and a student user comprising:

user input means including at least audio input means for delivering audible user responses to said system and speech recognition means associated with said audio input means;

user interface means including at least audio output means;

program controller means for dynamically generating said interactive lesson; and

a plurality of databases for access by said program controller means in interpreting user responses input to said user input means including at least one lesson database and at least one lesson-based speech interpretation database.

Claim 7, line 10, after "program controller means for" insert --dynamically--.

Claim 9, line 3, delete "storage".

21.   A computer-based learning system for providing an interactive lesson between the computer and a student user comprising:

user input means including at least audio input means for delivering audible user responses to said system and speech recognition means associated with said audio input means;

user interface means including at least audio output means;

program controller means for <u>dynamically</u> generating said interactive lesson; and

a plurality of databases for access by said program controller means <u>in interpreting user responses input to said user input means</u> including at least one lesson database, a plurality of lesson-based speech interpretation databases at least comprising one database of anticipated incorrect student responses and one database comprising the set of all possible combinations of correct student responses; and at least one database of acoustic information for use by said speech recognition means in interpreting student responses.

25. (Amended)   A system for recognizing speaker utterances of known textual material comprising:

means for receiving audible input from said speaker;

at least one database for storing a plurality of versions of said known textual material including at least a database of all possible combinations of correct student responses;

speech recognition means for comparing said audible input to said plurality of versions for generating an output based upon said comparing.

Claim 26, line 1, delete "at least one database" and insert --said plurality of databases--.

29. (Amended) A system for providing effective speech recognition by a speech recognition system of user utterances of text comprising:

means for inputting text to said system;

means for generating a plurality of phoneme sequences based on said input text;

means for generating a plurality of variations of said input text; and

at least one storage means for storing said plurality of phoneme sequences and said plurality of variations of said input text for use by said speech recognition system.

31. (Amended) A method for providing an interactive language lesson between a student user and a computer having at least a program controller, speech recognition means, at least one first database for storing said lesson and at least one second database

for storing lesson-based speech interpretation information, user input means for providing responses from said student user, and output means for providing information relating to said lesson to said user, comprising program controller steps of:

determining an interaction level for said student user; and

dynamically generating said interactive language lesson by:

retrieving lesson information appropriate to said interaction level from said at least one first database and lesson-based speech interpretation information corresponding to said lesson information from said at least one second database;

providing lesson information to said user at said output means;

providing lesson-based speech recognition information to said speech recognition means;

prompting said student user to provide responses at said user input means;

receiving student responses from said user input means;

interpreting said student responses at said speech recognition means; and

generating an output based upon said interpreting of said student responses.

32. (Amended) The method of Claim 31, wherein said computer has at least one additional database for storing student level information, and wherein said determining comprises [further comprising] the step of retrieving student level information from said at

least one additional database; and adjusting said lesson information based upon said

retrieval of student level information.

Claim 33, line 2, after "on" insert --said interpreting of--.

Claim 39, line 1, change "system" to --method--.

40. (Amended) A method for speech recognition means to interpret student

utterances of known text in a lesson comprising:

receiving student utterances;

accessing lesson-based speech interpretation information from one or more

lesson-based database and acoustic information from at least one acoustic database;

comparing said accessed information to said [receiving] received utterances; and

generating an output based upon said comparing.

42. (Amended) A method of providing effective speech recognition by a speech

recognition system of user utterances of text comprising:

inputting text to said system;

generating a plurality of phoneme sequences based on said input text;

generating a plurality of variations of said input text; and

storing said plurality of phoneme sequences and said plurality of variations of said input text <u>for use by said speech recognition system.</u>

44. (Added) The system of Claim 1 wherein said plurality of databases includes a reading level information database for use by the program controller in adjusting the complexity of the interactive lesson.

45. (Added) The system of Claim 6 wherein said plurality of databases includes at least one story text database including story text and phrasing indicators for use by the program controller in presenting the interactive lesson.

46. (Added) The system of Claim 6 wherein said plurality of databases includes at least one story page layout database for use by the program controller in presenting said interactive lesson.

47. (Added) The system of Claim 1 wherein said plurality of databases includes a session database for maintaining user session information.

48. (Added) The system of Claim 47 wherein said program controller is adapted to replay segments of a user session based on input from said session database.

49. (Added) The system of Claim 47 wherein said program controller receives input from said session database for establishing a starting point for said interactive lesson based on said user session information.

50. (Added) The system of Claim 6 wherein said plurality of databases further comprises at least one display prompt database for use in generating audio output for user selected portions of said visual output.

51. (Added) The system of Claim 1 wherein said plurality of databases includes at least one text power set database for use by said speech recognition means for interpreting user input.

REMARKS

Claims 1-43 were pending in the parent application, and Claims 10, 15, 20, 24 and 37, which are allowed in the parent application, have been cancelled by this Preliminary Amendment. This amendment responds to the new rejections raised in the Final Office Action dated June 21, 1999 for the parent application.

In the Final Office Action, Claims 1-9, 11-14, 16-19, 21-23, 25-36 and 38-43 stand rejected under 35 USC §102(e) as anticipated by Mostow, et al; Claims 11-12 are rejected as obvious in view of Mostow, et al; and Claims 21-23, 25-26, and 28-30 are rejected under 35 USC §103 as unpatentable in view of the combined teachings of Mostow and Shpiro; and Claims 31-36 and 38-40 as anticipated by Waters.

The Examiner has rejected Claims 1-9, 11-14, 16-19, 21-23 and 38-43 under 35 USC §102(b) given the teachings of the Mostow, et al reference. Applicants respectfully submit that the Mostow reference does not anticipate the invention as claimed. The Mostow reference provides for a reading coach that "listens" to student utterances and, if necessary, asks the student to repeat the suspect word and then speaks the correct word (see: Page 78, col. 1, line 17). The Mostow article specifically states that the system "...just has to detect where the reader is and which words were missed--it doesn't have to identify what the speaker said instead" (see: Page 77, Col. 2, lines 32-35). Moreover, the Mostow article defines "...mistakes as `important words that the reader failed to speak'" (Page 77, Col. 2, lines 19-20) and goes on to state that "mispronunciations...are not considered reading mistakes and must therefore be tolerated" (Page 77, Col. 1, lines 39-41). Therefore, it is clear that the Mostow system comprises a speech tracking system rather than a speech recognition system (Claims 1, 7, 21, 25, 29, 31, 40, 42) with speech recognition means and a program controller having access to at least one lesson-based speech interpretation database (Claims 1, 21 and 31); a plurality of phoneme sequences

and variations of said input text (Claims 29 and 30); a database of anticipated incorrect student responses (Claims 2 and 26); a database of all possible combinations of correct student responses (Claims 3 and 27); and/or at least one database of acoustic information for use by the speech recognition means in interpreting student responses (Claims 4, 5, 30, 41 and 43).

To anticipate an invention, a reference must teach each and every claimed feature. In light of the fact that the Mostow article does not teach a speech recognition system (Claims 1, 7, 21, 25, 29, 31, 40, 42) with speech recognition means and a program controller having access to at least one lesson-based speech interpretation database (Claims 1, 21 and 31); a plurality of phoneme sequences and variations of said input text (Claims 29 and 30); a database of anticipated incorrect student responses (Claims 2 and 26); a database of all possible combinations of correct student responses (Claims 3 and 27); and/or at least one database of acoustic information for use by the speech recognition means in interpreting student responses (Claims 4, 5, 30, 41 and 43), Applicants contend that an anticipation rejection cannot be maintained. Since the limitations of the independent Claims, 1, 7, 21, 25, 31 and 40 are clearly not taught by the Mostow article, neither those claims nor the claims which depend therefrom are anticipated by Mostow. It is further maintained that the claim features recited in those independent claims are not obviated by the Mostow article since Mostow neither teaches nor suggests actual speech

recognition, any lesson-based interpretation or any mistake detection other than a reader's failure to speak a word.

With respect to the rejection of Claims 11 and 12 under 35 USC §103, in view of the teachings of the Mostow reference, Applicants respectfully submit that, although the Mostow system does monitor where the student is in the text (i.e., tracks the student), and discusses that results should be evaluated, there are no teachings in the Mostow article which provide one skilled in the art with sufficient information to enable them to implement an automatic monitoring or evaluating function in combination with speech recognition. Since the Mostow system does not recognize speech and is not equipped to recognize or interpret any mistakes other than a reader's failure to speak a word, it cannot be maintained that the Mostow system monitors student progress based on responses (Claim 11, and also Claims 16, 23 and 33) nor that the Mostow system generates student progress information and stores same (Claim 12, and Claims 17 and 34).

In response to the Examiner's rejection of Claims 21-23, 25-26 and 28-30 based on a combination of the Mostow and Shpiro patent teachings, Applicants reiterate that the Mostow patent does not provide any speech recognition means (as set forth in independent Claims 21, 25) nor any lesson storage database for storing an interactively generated lesson (Claim 22), nor monitoring student progress, generating information regarding the student's progress, nor altering the level of interaction with the user based on the monitoring (Claim 23), nor at least one database of anticipated incorrect responses

(Claim 26). Further, the Shpiro patent does not disclose those teachings which are missing from the Mostow article. As set forth in arguments submitted in the parent patent application, the Shpiro system simply retrieves and presents a statically stored lesson. The Shpiro patent does not disclose any lesson storage database for storing an interactively generated lesson (Claim 22) nor does it teach monitoring and altering the level of interaction based on the monitoring (Claim 23), nor does it disclose the use of additionally stored acoustic information for speech interpretation (Claim 28). While Shpiro does include a database having one correct and several incorrect versions of the lesson text, such is not the same as teaching or suggesting the database of anticipated incorrect responses of Claim 26 in combination with the additionally cited limitations of Claim 25 from which it depends.

Similarly, Claims 29 and 30 are not obviated by the combination of teachings of Mostow and Shpiro. Claim 29 recites a means for inputting text to a system, means for generating a plurality of phoneme sequences of input text, along with means for generating a plurality of variations of the input text, and means for storing the generated information. Neither the Mostow nor the Shpiro patent teaches these automatic means for generating database information for later use in speech interpretation. Since neither patent teaches or suggests such means, it is respectfully maintained that the apparatus Claims 29-30 as well as the parallel method Claims 42 and 43 are allowable over the cited art.

Finally, the Examiner had rejected Claims 31-36 and Claims 38-40 as anticipated by the Waters patent. The Waters patent provides a language lesson system which compares student input to the "course of study", generates audio output and which further "varies the course...in dependence on the user's temporal history of correct and incorrect replies" (see: column 4, lines 40-47). It is respectfully submitted that the Waters system does not anticipate the claimed invention since the Waters system does not provide lesson-based speech recognition information to the speech recognition means. Rather, the Waters system interprets the student input and then compares it to the lesson to determine if the student input is correct or incorrect. The Waters system does not use the lesson-based speech recognition information in recognizing the student input (independent Claim 31 and Claims 32-36 and 38-39 which depend therefrom). Further, the Waters system simply keeps track of the "temporal history" of correct and incorrect replies, which does not anticipate the claimed monitoring of progress based on interpretation of student responses (Claim 33 and Claims 34-36 which depend therefrom). As such, Applicants believe that the Waters patent does not anticipate the invention as set forth in Claims 31-36 and 38-39.

While the Examiner has cited the Waters patent against Claim 40 as well, Applicants believe that the previously-submitted amendments, which are reiterated in this Preliminary Amendment to the continuation application, successfully distinguish Claim 40 from the teachings of the Waters patent. The Waters patent does not provide an acoustic

interpretation database, nor does it interpret student responses using any input that is lesson-based. Therefore, Applicants assert that the Waters patent does not anticipate Claim 40.

In light of the foregoing, it is respectfully requested that the objections and rejections to this Application be reconsidered and withdrawn, the newly submitted claims be entered, and the remaining Claims 1-9, 11-14, 16-19, 21-23, 25-36, 38-40 and 42-51 be passed to issuance.

Respectfully submitted,

H. W. Adams, et al

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SYSTEM AND METHOD FOR INTERACTIVE READING AND LANGUAGE
INSTRUCTION

Field of the Invention

This invention relates to computer-based instruction and more

5   particularly to the use of computers having speech recognition

software uniquely provided to simulate continuous speech

recognition of juvenile speech in order to teach reading and/or

language.   The system further provides an interactive, variably-

paced course of instruction, the progress of which can be

10   automatically adjusted, and provides for uploading or display of

the lesson workproduct at any time during or after completion of a

lesson.

Background of the Invention

Computer instruction for reading and language was first

15   implemented in the 1970s and has progressed in complexity with

developments in the technology.   An early system, as detailed in

U.S. Patent No. 4,078,319 of Mazesli, et al, utilized optical

components to train the student's eyes to focus on particular

material and to advance laterally along the line of material to be

20   taught, thereby teaching the mechanics of reading.   Increasingly

sophisticated systems incorporated audio presentation of the

material to be learned, thereby simulating a human instructor and providing a degree of passive error control and correction. Systems which provide audio presentation are particularly well suited for foreign language instruction.

A reading teaching system having simultaneous audio and visual display of material is taught in U.S. Patent No. 4,397,635 of Samuels, wherein the audio and/or the visual display of the material is altered to enhance the student's understanding of the meaning of the material to be learned (e.g., lower volume audio and downwardly-slanted lettering would be used in presenting the word "down"). Yet more complex is the system described in U.S. Patent No. 5,540,589 of Waters, wherein voice recognition is utilized for instruction and for monitoring of a student's progress. The Waters system is designed to repeat material which is incorrectly "learned," as evidenced by recognized vocal responses, and to recommend termination of a session if errors exceed a preset fault tolerance.

A particular challenge associated with speech recognition systems, and critical to successful implementation of an automatic interactive reading system for a young child, is development of a children's speech model. Due to the range of pitch of children's voices, the irregular and unpredictable pace at which small children utter sounds, syllables, words and phrases, often without pausing to breathe where an adult would pause, their uncertain articulation, and the often strong influence of foreign languages spoken at home, prior art speech recognition systems have been

unsuccessful at effectively recognizing speech uttered by children. Additional challenges to speech recognition include pronunciation variations attributable to regional dialects, foreign accents, common articulation problems, and idiosyncracies associated with various stages of speech development. An automatic interactive reading/language system must be able to address the foregoing challenges in order to be productive.

It is desirable to develop a system which will not only provide audio presentation and speech recognition, but also provide an interactive environment in which the tempo of presentation of material can be automatically adjusted to accommodate the student's level of skill and advancement through the program, wherein the student, and particularly a juvenile student, may participate with the program with increasing interaction as proficiency increases. Also desirable, for purposes of independent review, entertainment, and reward, is a system which can display the workproduct of each lesson by uploading and/or local display of the interactively-created presentation.

It is therefore an objective of the present invention to provide a computer-based reading or language instruction system and method, incorporating speech recognition software, for interpreting the student responses, interacting with the student, and altering the pace of the instruction based upon the student's responses.

It is a further objective of the invention to incorporate means for correcting student responses and audibly generating the correct responses as a means for simulating the activities of a

teacher.

Yet another objective of the invention is to provide a system incorporating a database having lessons with varying degrees of student interaction to automatically increasingly challenge the learner and means to present those lessons in varied ways depending upon the proficiency of the student.

Another objective of the invention is to provide a speech recognition database to enhance recognition of children's speech and speech which is otherwise difficult to recognize.

Still another objective of the invention is to provide a system which will coordinate and display a joint performance of the inputs contributed by the student and the computer instructor in such a manner as to illustrate the student's reading or language proficiency.

Summary of the Invention

The above and other objectives are provided in the present invention which utilizes a mechanism to permit a computer-based instruction program in reading or language instruction to implement a shared reading program, wherein portions of the text are read by the student and portions by the computer itself. The proportion of the text "read" by each participant and the pace at which the lesson progresses can each be automatically altered based upon the proficiency of the student. In addition, the system represents a

computer companion to share the task of reading or language learning by modeling the task for the learner, variably controlling the amount of material that the student reads aloud based upon a computer assessment of the student's ability, helping the learner navigate through the instructional application, and participating in a joint performance that demonstrates the student's reading.

The foregoing are accomplished by providing a system having an executive program, for administration and execution of the shared reading program; audio input means having associated speech recognition means with access to a plurality of databases, including a database built upon a unique acoustic model for simulating continuous recognition of speech and at least one lesson-based speech recognition database; optional non-speech input means; and lesson output means. The executive program generates a computer instructor, perhaps an animated character, that asks the student questions, directs reading tasks, reads what the student does not read, and helps navigate the student through the application via the lesson output means, including audio and optional visual outputs. The system is provided with a plurality of databases including at least a database of textual fragments, organized by attributes such as difficulty and position, and means for defining sections for the student to read and sections for the computer instructor to read; and the aforementioned lesson-based databases of anticipated responses, including multiple variations of groupings of sounds in the responses and anticipated mispronunciations, for speech recognition.

Brief Description of the Drawings

The invention will now be described in further detail with specific reference to the attached figures wherein:

Figure 1 illustrates a basic block diagram of the inventive system;

Figure 2 schematically illustrates the system controller components and the intercommunications paths among same; and

Figure 3 illustrates the textual database support for shared language learning.

Figure 4 provides a representative flow chart of tasks for the executive program.

Description of the Preferred Embodiment

The invention, in its most basic embodiment as illustrated in Figure 1, comprises a system controller 118, comprising an executive program having access to information stored in one or more storage locations, illustratively depicted as disk 119. It is to be noted that internal or external storage means other than disk storage could clearly be utilized, provided that the executive program can readily access stored data and/or applications. Textual or instructional input from a student user to the system controller is provided via one or more non-speech user inputs,

shown representatively as keyboard 128 or mouse 138, while audio input is provided via microphone 120. Output from the system controller for interaction with the student is provided as video output at the graphical user interface, display 107 or as audio output via speaker 114. Combination of components in stand-alone systems, or omission of one of the input or output devices, is common practice which may affect the necessary software available to the system controller, but would not alter that which is novel to the present system. A most basic implementation of the instruction system may incorporate only audio input and output means, with visual student stimuli being provided by a physical textbook or storybook. The essence of the invention concerns the particulars of the databases, the actions of the executive program and the actions of the speech engine. The other illustrated or mentioned components deserve no further detailed attention except insofar as they provide a context for clarifying the necessary details of the invention. From the student user perspective, a representative system would comprise a personal computer having a keyboard and/or a mouse for controlling the pointing device (8 of Figure 2), a monitor, one or more speakers and a microphone. The student may or may not be required to load a program from a CD-ROM or diskette, or download same from a dedicated network or the internet, depending upon the specific embodiment.

The executive program orchestrates the instruction and interaction between the student user and the system, and requires access to additionally stored databases of relevant information,

representatively depicted at the storage locations on disk 119 of Figure 1. While the databases of stored information are detailed below, it will be understood by one having skill in the art that the specific contents of the databases may vary slightly without

5   departing from the intent of the invention. In addition, it is clear that the information may be combined into one or more larger databases, provided that all of the information remains accessible in the system. The databases, with reference numerals related to Figure 2, are as follows:

10   **reading level information database** 9-controls information representing the user's recent performance and current level which information is used to change the amount of support given to the user during his or her reading;

        story text database 10-includes the text of the story and

15   phrasing indicators that are used to break up the text and control the amount of material that the learner is asked to read;

        story page layout database 11-includes information regarding the number and dimensions of the pages, the positioning of text blocks and their sequencing, the positioning and size of graphics,

20   and the coordinates used for routing the companion around the screen;

        session database for replay and resumption 17-contains all the information necessary to provide a replay of the joint reading of the text by the companion and the student, including the portions

25   read correctly by the student, and the portions read by the computer instructor/companion, along with information about audio

annotations to the text, and an optional video introduction to the joint reading performance. This database also allows the student to resume the session at a later time, and enables storage of the session for uploading and transmission or for local review at a later time;

audio clip database 16-indexes a digital representation of the audio for all feedback and directional messages, words, and phrases by their textual form;

picture prompt database 18-contains pointers to audio information maintained in the audio clip database such that by student selection of a picture function, the system will generate an audio expression of what the picture represents in terms of the overall story;

page overview database 19-contains pointers to audio information maintained in the audio clip database such that by student selection of the page overview function, the system will generate an audio expression of what the contents of the page mean to the overall story;

feedback message database 21-contains all feedback messages designed to offer information to the student, categorized as to the type of message, such that messages within a given category are selected randomly from that category for delivery when appropriate;

learner population-specific acoustic model 3-an acoustic representation of children's speech that is used by the speech recognition engine to enhance recognition of children's speech and assist in assigning a textual interpretation to the received speech

signals;

alternate phrase and pronunciation database 4-a phonemic representation of different ways to pronounce words in the currently active vocabulary (i.e., in the text which is being read at any given time);

text power set database 12-a phonemic representation of the power set of contiguous words in the text which is being read tat any given time to effect pseudo-continuous speech recognition;

student level controller 15-changes the level of the reading task based on information contained in the reading level information database so that students receive more examples of the reading being modeled and are asked to read relatively smaller portions of the text as the level decreases, and vice versa as the level increases; and

local text position management database 22-contains all information regarding the current point of reading which is used for managing the cursor or for determining whether a word has been read.

The paths for communications and information handling among the various system components, applications and databases are representatively illustrated in Figure 2 and will be detailed in the following description of the operation of the system. When initiating a lesson (and throughout the lesson), the executive program 6 receives input from the student user via the non-speech user input interface 8 (i.e., a mouse, keyboard, touchpad, touchscreen, or other known non-speech input device) and/or from

microphone 20 via the speech recognition interface 2 and speech recognition engine 1. The speech recognition engine will be provided with information from the learner population specific acoustic model 3, the alternate pronunciation and phrase database 4, and the text power set database 12 for stored information to facilitate recognition of the audio input.

The learner population specific acoustic model assists the speech recognition engine in simulating continuous recognition of the learner population's, representatively children's, speech. Given the idiosyncracies of the speech of the anticipated users, an acoustic model of that speech is provided to enhance recognition. As noted in the Background section, the idiosyncracies of children's speech generally defy recognition on a continuous speech basis, and the acoustic model for purposes of this description is that of children's speech. If the anticipated user group is adult, adult with particular speech disorders, adult with a given foreign accent, teen, etc., an appropriate acoustic model can be developed accordingly.

The alternate phrase and pronunciation database 4 and the text power set database 12 are additionally provided to enhance recognition of the uttered responses. Both of these latter databases, 4 and 12, are based upon the text of the story to be read. As the executive program is providing a portion of the text for display to the student user, or directing the student's attention to a particular page of text in the embodiment having no computer-based visual output means, the alternate phrase and

pronunciation versions of that text, and the power sets of that text are provided to the speech recognition engine in order to assist in interpretation of the responses uttered by the student user.

5   The text power set database is developed based on the fact that certain anticipated users (and, again representatively children, though it may well apply to teen and adult users) may not breathe or pause between words or phrases, thereby rendering continuous speech recognition ineffective. In order to make

10   discrete speech recognition effective for those anticipated users, power sets of contiguous words, which might be run-together, are developed and provided in the text power set database.

       To develop the text power set database, knowing that it is not realistic to have all of the anticipated users train the speech

15   recognition system, the database is generated independently and preferably automatically. In so doing, the signals for phoneme sequences in the text are input and variations of the phoneme sequences are generated as the contents of the database. As such, for example, the phrase "the dog barks" may be stored in the text

20   power set database as "thedog barks", "the dogbarks", "thedogbarks" and "the dog barks". The phoneme sequences which are stored can, clearly, also include portions of words, separated at logical syllabic breaks. As might be expected, by providing many alternative correct responses, one is broadening the interpretation

25   space around the text. As a result, many more utterances will be recognized as correct than would have been when using the speech

recognition engine alone. The alternate phrase and pronunciation database is, therefore, provided to assist in re-narrowing the search space about the actual text.

The alternate phrase and pronunciation database provides both

5   alternative correct pronunciations (e.g., "aks" for "ask") but also anticipated miscues for pronunciation of the text (e.g., "dark" for "bark"). By accessing the alternate phrase and pronunciation database, the speech recognition engine can reject incorrect utterances which would otherwise be accepted based upon the broader

10   text power sets. Automatic generation of the alternate phrase and pronunciation database requires training the system in linguistic knowledge including: common pronunciation problems, such as running adjacent consonant sounds together; common reading problems, such as seeing "was" as "saw"; common substitutions of letters, such as

15   "b", "d", "p" and "q"; etc. all based upon the known text of the lesson.

By iteratively building the databases based not only upon correct responses, but also upon variant combinations of contiguous correct responses and of anticipated mispronunciations influenced

20   by age, foreign accent, regional dialect, etc., of the correct responses based on the text, the system is able to discretely recognize the speech as if it is being continuously recognized. The databases capture all anticipated variants and combinations of sentences, phrases, words, syllables, and sounds which could

25   logically be uttered based upon the portion of the text being viewed for reading. Speech recognition therefore becomes a much

less complex matching problem when the universe of possible utterances is bounded by sets of anticipated responses.

In response to student initiation of a lesson, the executive program will receive input from the student level controller 15 to determine the level of shared language lesson to be presented. The student level controller, 15, in turn retrieves input from the reading level information database, 9, concerning the user's most recent performance and current level of lesson. The levels of lesson range from a beginner level, at which all of the lesson is read by the computer instructor/companion, to the most advanced level, at which the student performs all of the reading. Levels in between have the computer instructor reading part of the textual segments, with the student reading the remaining portion(s) in shared reading interactions. For the sake of this description, a juvenile student will be assumed, and the lesson through which the student will be guided is the reading of an early-reader storybook.

Once the executive program has determined an appropriate level for the lesson, the lesson in retrieved from associated databases, including the story text database 10, audio clip database 16 (if real-time speech synthesis is not available to the executive program), and story page layout database 11. At the same time, the executive program generates the reading companion 5 to instruct the student through the lesson. Text segments with page graphics are provided for viewing by the student at the graphical user interface 7, with accompanying audio output provided at 14, while appropriate text-based information from the alternate phrase and pronunciation

database 4 and the text power set database 12 is provided to the speech recognition engine. As noted above, an alternative embodiment for providing instruction at a lesser cost may eliminate the visual display, relying upon the student's attention to a physical textbook, as cued via the audio output of the computer.

For our early reader example, the illustrated book cover would be displayed along with an audio introduction. The student could then prompt the system, for example by clicking on a page icon, to open the book to begin the story. The page icon remains available to the student, in a continuously-displayed task bar, to turn the page and proceed with the story, or even to skip pages, at any time. Additional icons or words may be displayed continuously for prompting the system to perform an alternative function, as will be further described below.

For beginner and intermediate level lessons, visually displayed text segments will be accompanied by simultaneously rendered audio presentation of the text segments from audio output 14. As noted above, the audio text segments may be synthesized in real time by the executive program or retrieved from the audio clip database 16 and synchronized to the visual output by the executive program. For our early reader example, it is presumed that display of the text will always be accompanied by the story illustrations, ideally with the exact visual layout of the storybook being reproduced on the computer monitor.

The positional pacer 17, with input from the local text position management databases 22, may be implemented to

continuously prompt the student along the text, identifying (e.g., "follow the bouncing ball") the word that is being read by the computer instructor or is to be pronounced by the student. In addition, the executive program may highlight or color differentiate the text to be read by the computer and that to be read by the student. At each juncture of the lesson at which the student is to utter one or more text segments, the user's input is provided to the speech recognition interface 2 as described above. Correct input may be passively acknowledged, simply by the progress of the lesson to the next text segment, or actively acknowledged by audio output generated via access to the feedback message database 21. Rapid progress, as sensed by the positional pacer, will cause the positional pacer to increase the tempo of the lesson. If the user correctly pronounces the "current" (e.g,, highlighted) word before the pacer reaches the boundary between that word and the next word (the right boundary for standard left-to-right English reading), the pacer will accelerate slightly. Similarly, if the pacer reaches the boundary before the user pronounces the word, the pacer will slow its overall rate slightly. As will be understood by one having skill in the art, the pacer function can be implemented as a separate pacer task or pacer subroutine of the executive program.

Throughout the lesson, the audio inputs from both the student and the computer instructor, along with the text as displayed for utterance by each party, are stored at the session database for replay and resumption 17. After a lesson has been completed, the

student may enjoy a reprise of the lesson to review progress and to identify areas for concentrated effort in the future. Storage and optional uploading of the lesson, in edited or unedited form, can be provided for independent instructor, peer, parent or personal

5   student review of the lesson or for remote or deferred monitoring of progress (e.g., in the context of a correspondence-type course wherein an instructor or evaluator may review the performance). The aforementioned editing may refer to system incorporation of re-read and corrected utterances into the stored performance, and/or

10 insertion of visual or audible annotations (e.g., "This was the easiest page!") provided from the student by invoking an annotation function. The executive program may also compile lists or annotate pre-compiled lists of words in the text which have been successfully read or missed. All of the foregoing can facilitate

15 independent review of the student's progress.

During a lesson, the student user may alternatively select from one or more options to review the lesson to date or to select "help" for audio assistance. To review the lesson, for example, the student would click on a "playback" icon, or otherwise input

20 the appropriate trigger. In response, the executive program would access the session database for replay and resumption 17. As is evident from the name of the database, as well as from its described functionality, a student may return to a particular lesson and resume that lesson at the point at which they last

25 exited the lesson, rather than having to repeat all of their previous work, by accessing a previous lesson stored at 17.

Databases 18 and 19, the picture prompt database and page overview database, respectively, may be accessed when the student user selects an appropriate icon to receive audio "help." Specifically, in accordance with one embodiment of the invention, in response to the student clicking on a particular illustration or part of an illustration on the displayed storybook page, the executive program will access the picture prompt database 18 to generate an audio expression of what that illustration or part of the illustration means or represents in the context of the story. Similarly, it the student reader wishes to know how an entire page fits into the story, the student can click on an icon to retrieve the requested page information from the page overview database for audible presentation. If a student is having difficulty in reading/pronouncing a particular word, the student may request help for that one word at any time.

As the student progresses through the lessons in the application, the executive program 6 regularly updates the reading level information database 9 with a revised estimate of the student's competency based upon his or her performance. Each update that changes the estimate can potentially change the manner in which the reading or speaking of a textual segment will be shared for the present lesson or future lessons. If the estimate of the student's ability improves, the interaction between the computer instructor and the student may move from level N (where all but the last N words in a text segment are "read" by the computer instructor) to level N+1. Each level of interaction is

associated with a pattern of shared initiative that is applied to a given text segment as illustrated in Figure 3. A feature can also be implemented whereby the student can select the lesson level prior to commencing, or at any time during, the session.

Figure 3 abstractly describes the layout and types of information maintained in the story text database 10, showing that each word token, depicted as 27 in text segment 28, is present along with a level indicator 29 which is used to determine whether the student is being asked to read or pronounce the token or whether it is being supplied by the computer instructor. Under this unique text storage scheme, only a single version of the text must be stored, from which a myriad of different renderings (i.e., combinations of shared reading between the instructor and the student user) of the text can be generated. The executive program interprets the level values and phrase information in the text database for each token to yield the interaction for a particular text segment. This interpretation defines exactly what is supposed to be read by the computer instructor and what is to be read by the student. Each level applies a different interpreter to the text segment to yield the interaction for that level.

Figure 4 provides a representative process flow through which the executive program will progress in a typical lesson. At box 201 the executive program receives student logon or session commencement input, followed by an optional step, at 202, of verifying user access to the program (this optional step is particularly significant for fee-based network implementations of

the invention and would be readily implemented in accordance with known logon/verification schemes). The executive program would next access the student level controller, at step 203, to determine what lesson is to be delivered at the graphical user interface, and at what level of interaction. Upon establishment of the student level, the executive program will access the relevant databases (e.g., story text, audio clip, and layout) at 204 and proceed at 205 to generate a display of a portion of the lesson and the reading companion character which will audibly prompt the student to read some or all of the displayed portion of the lesson. While the text is being accessed for display at 204, the text power set database and alternate phrase and pronunciation databases are being accessed for the sets of possible responses which correspond to the text to be displayed and are being provided to the speech recognition engine at step 239.

The order in which steps 204 and 239 are conducted is arbitrary, provided that the speech recognition engine has the information it needs prior to receipt of student utterances. The steps may also be implemented such that the speech recognition engine is provided with database information corresponding to the next expected portion of text to be provided at the user interface, in advance of provision of that text for display to the user. In that way, the speech recognition engine will be prepared in advance for the expected utterances.

The executive program next waits to receive input from the student. If input is not received within a preset time frame, as

determined at decision box 240, the executive program may generate a gentle reminder to proceed, at box 241, followed by another decision box 242. If no response is forthcoming within another timed interval, the program will shutdown at 243 under the assumption that the student has abandoned the terminal.

If, however, the answer at either decision box indicates that the student has responded, with the response having been received and recognized by the speech recognition engine having access to the aforementioned speech recognition enhancement databases, the executive program next evaluates the received response at box 207. If the response is not correct, the executive program may access the feedback message database and generate appropriate feedback, at 211, encouraging the reader to respond again. If the repeated response is incorrect, as determined at box 212, the executive program may generate the correct response at 213. If a correct response is received at either 207 or 212, optional positive feedback may be generated at 208. Responses received from the student and audio output, along with the visual output generated by the executive program, (collectively known as the "joint performance") are stored at the session database for replay and resumption in step 209.

After storing the current segment of the lesson, the executive program checks to see if the previously displayed text is the last portion of the lesson, at decision box 214. If there is more to the lesson, the system returns to step 205. If, however, the lesson has been completed, the executive program will, via the

reading companion, inquire if the reader wishes to continue with another lesson, at step 215. If the student reader wishes to continue, the program will return to step 204 to access story text, etc. from the database. If the student does not wish to continue,

5   the executive program may ask the user if display of the stored joint performance is desired, at step 217. Depending upon the response, the program will either display the joint performance, at step 219, or terminate the session, at 218.

The program may periodically interrupt the process flow for,

10   or periodically perform a parallel operation of, updating the reading level information database as to the student's proficiency. In addition, the student may randomly interrupt the process flow by requesting a page overview or other "help" functions as discussed above. The interrupts are not illustrated, but the process flow in

15   response to each of the foregoing will be readily apparent to one having skill in the art.

The invention has been described with reference to several specific embodiments. One having skill in the relevant art will recognize that modifications may be made without departing

20   from the spirit and scope of the invention as set forth in the appended claims.

CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1   1. A computer-based learning system for providing an
2   interactive lesson between the computer and a student user
3   comprising:

     user input means including at least audio input means for
delivering audible user responses to said system and speech
recognition means associated with said audio input means;

     user interface means including at least audio output
means;

     program controller means for generating said interactive
10   lesson; and

11   a plurality of databases for access by said program
12   controller means including at least one lesson database and at
13   least one lesson-based speech interpretation database.

1   2. The system of Claim 1 wherein said at least one lesson-
2   based speech interpretation database comprises at least one
3   database of anticipated incorrect student responses.

1   3. The system of Claim 1 wherein said at least one lesson-
2   based speech interpretation database comprises at least one

3 database comprising the set of all possible combinations of
4 correct student responses.

1 4.   The system of Claim 1 further comprising at least one
2 database of acoustic information for use by said speech
3 recognition means in interpreting student responses.

1 5.   The system of Claim 4 wherein said database of acoustic
2 information comprises acoustic information relating to speech
3 by a specific class of students.

1 6.   The system of Claim 1 further comprising visual output
2 means for display of information accessed from said at least
3 one lesson database by said program controller means.

1 7.   A computer-based learning system for providing an
2 interactive lesson between the computer and a student user
3 comprising:
4   user input means including at least audio input means for
5 delivering audible user responses to said system and speech
6 recognition means associated with said audio input means;
7   user interface means including at least audio output
8 means;
9   program controller means for generating said interactive
10 lesson; and
11   a plurality of databases for access by said program

12 controller means including at least one lesson database and at
13 least   one   lesson   storage   database   for   storing   the
14 interactively generated lesson.

1   8.   The system of Claim 7 wherein said system further
2   comprises visual output means and wherein said program
3   controller is adapted to display said interactively generated
4   lesson stored in said at least one lesson storage database.

9.   The system of Claim 7 further comprising network means
for providing said interactively generated lesson stored in
said at least one lesson storage database from said computer
to a remote location.

10. A computer-based learning system for providing an
interactive lesson between the computer and a student user
comprising:

4   user input means including at least audio input means for
5   delivering user speech to said system and speech recognition
6   means associated with said audio input means;
7   user interface means including at least audio output
8   means and visual output means;
9   program controller means for generating said interactive
10 lesson;
11   a plurality of databases for access by said program
12 controller means including at least one lesson database; and

13   wherein said program controller means additionally

14   comprises means for providing a prompt to pace the student

15   through said lesson and wherein said pace is determined by

16   said executive program assessing said student speech.

1   11.   The system of Claim 1 wherein said program controller is

2   adapted to continually monitor student progress based on said

3   student responses.

1   12.   The system of Claim 11 wherein said program controller is

2   further adapted to generate student progress information based

3   on said monitoring; and further comprising at least one

4   storage location for storing said student progress

5   information.

1   13.   The system of Claim 11 wherein said program controller is

2   adapted to alter the level of interaction of the student with

3   said lesson based upon said monitoring.

1   14.   The system of Claim 11 wherein said program controller is

2   additionally adapted to generate at least audio output based

3   on said monitoring.

1   15.   The system of Claim 13 wherein said program controller

2   means additionally comprises means for providing a prompt to

3   pace the student through said lesson and wherein said pace is

4   determined by said monitoring.

1   16. The system of Claim 7 wherein said program controller is

2   adapted to continually monitor student progress based on said

3   student responses.

1   17. The system of Claim 16 wherein said program controller is

2   further adapted to generate student progress information based

3   on said monitoring; and further comprising at least one

4   storage location for storing said student progress

5   information.

1   18. The system of Claim 16 wherein said program controller is

2   adapted to alter the level of interaction of the student with

3   said lesson based upon said monitoring.

1   19. The system of Claim 16 wherein said program controller is

2   additionally adapted to generate at least audio output based

3   on said monitoring.

1   20. The system of Claim 18 wherein said program controller

2   means additionally comprises means for providing a prompt to

3   pace the student through said lesson and wherein said pace is

4   determined by said monitoring.

1   21. A computer-based learning system for providing an
2   interactive lesson between the computer and a student user
3   comprising:

4   user input means including at least audio input means for
5   delivering audible user responses to said system and speech
6   recognition means associated with said audio input means;

7   user interface means including at least audio output
8   means;

9   program controller means for generating said interactive
10   lesson; and

11   a plurality of databases for access by said program
12   controller means including at least one lesson database, a
13   plurality of lesson-based speech interpretation databases at
14   least comprising one database of anticipated incorrect student
15   responses and one database comprising the set of all possible
16   combinations of correct student responses; and at least one
17   database of acoustic information for use by said speech
18   recognition means in interpreting student responses.

1   22. The system of Claim 21 further including at least one
2   lesson storage database for storing the interactively
3   generated lesson.

1   23. The system of Claim 21 wherein said program controller is
2   adapted to continually monitor student progress based on said
3   student responses, to generate student progress information

4   based on said monitoring; and to alter the level of

5   interaction of the student with said lesson based upon said

6   monitoring.

1   24.   The system of Claim 23 wherein said program controller

2   means additionally comprises means for providing a prompt to

3   pace the student through said lesson and wherein said pace is

4   determined by said monitoring.

1   25.   A system for recognizing speaker utterances of known

2   textual material comprising:

        means for receiving audible input from said speaker;

        at least one database for storing a plurality of versions

        of said known textual material;

        speech recognition means for comparing said audible input

        to said plurality of versions and for generating an output

        based upon said comparing.

1   26.   The system of Claim 25 wherein said at least one database

2   comprises at least one database of anticipated incorrect

3   student responses.

1   27.   The system of Claim 25 wherein said at least one database

2   comprises at least one database comprising the set of all

3   possible combinations of correct student responses.

1   28. The system of Claim 25 further comprising at least one

2   database of acoustic information for use by said speech

3   recognition means in interpreting student responses.

1   29. A system for providing effective speech recognition of

2   user utterances of text comprising:

3   means for inputting text to said system;

4   means for generating a plurality of phoneme sequences

5   based on said input text;

6   means for generating a plurality of variations of said

7   input text; and

8   at least one storage means for storing said plurality of

9   phoneme sequences and said plurality of variations of said

10   input text.

     30. The system of Claim 29 further comprising at least one

     database having acoustic interpretation information.

1   31. A method for providing an interactive language lesson

2   between a student user and a computer having at least a

3   program controller, speech recognition means, at least one

4   first database for storing said lesson and at least one second

5   database for storing lesson-based speech interpretation

6   information, user input means for providing responses from

7   said student user, and output means for providing information

8   relating to said lesson to said user, comprising program

9   controller steps of:

10   retrieving lesson information from said at least one

11   first database and lesson-based speech interpretation

12   information corresponding to said lesson information from said

13   at least one second database;

14   providing lesson information to said user at said output

15   means;

16   providing lesson-based speech recognition information to

17   said speech recognition means;

18   prompting said student user to provide responses at said

19   user input means;

20   receiving student responses from said speech recognition

21   means; and

22   generating an output based upon said student responses.

     32. The method of Claim 31, wherein said computer has at

     least one additional database for storing student level

3   information, further comprising the step of retrieving student

4   level information from said at least one additional database;

5   and adjusting said lesson information based upon said

6   retrieval of student level information.

1   33. The method of Claim 31 further comprising said program

2   controller continually monitoring student progress based on

3   said student responses.

1   34.   The method of Claim 33 wherein said program controller is
2   further adapted to generate student progress information based
3   on said monitoring.

1   35.   The method of Claim 33 further comprising said program
2   controller altering the prompting of said student based upon
3   said monitoring.

1   36.   The method of Claim 33 further comprising said program
2   controller generating at least audio output based on said
3   monitoring.

1   37.   The method of Claim 33 further comprising providing means
2   to pace the student through said lesson, and altering said
3   pace based upon said monitoring.

1   38.   The method of Claim 31, wherein said computer further
2   comprises at least one lesson storage database, further
3   comprising the step of storing said interactive language
4   lesson at said at least one lesson storage database.

1   39.   The system of Claim 38 wherein said computer further
2   comprises visual output means, further comprising the step of
3   displaying said interactive language lesson stored in said at
4   least one lesson storage database.

1   40. A method for speech recognition means to interpret

2   student utterances of known text in a lesson comprising:

3   receiving student utterances;

4   accessing lesson-based speech interpretation information

5   from one or more lesson-based database;

6   comparing said accessed information to said receiving

7   utterances; and

8   generating an output based upon said comparing.

1   41. The method of Claim 40 further comprising the steps of

2   accessing acoustic information from at least one acoustic

3   database and comparing said acoustic information to said

4   student utterances.

1   42. A method of providing effective speech recognition of

2   user utterances of text comprising:

3   inputting text to said system;

4   generating a plurality of phoneme sequences based on said

5   input text;

6   generating a plurality of variations of said input text;

7   and

8   storing said plurality of phoneme sequences and said

9   plurality of variations of said input text.

1   43. The method of Claim 42 further comprising providing at

2   least one database having acoustic interpretation information.

SYSTEM AND METHOD FOR INTERACTIVE READING AND LANGUAGE INSTRUCTION

ABSTRACT OF THE INVENTION

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10

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A reading or language interactive system which utilizes a mechanism to permit a computer-based instruction program in reading or language instruction to implement a shared reading program, wherein portions of the text are read by the student and portions by the computer itself. The proportion of the text "read" by each participant and the pace at which the lesson progresses can each be automatically altered based upon the proficiency of the student. In addition, the system utilizes a computer instructor to share the task of reading or language learning by modeling the task for the learner, variably controlling the amount of material that the student reads aloud based upon a computer assessment of the student's ability, helping the learner navigate through the instructional application, and participating in a joint performance that demonstrates the student's reading.

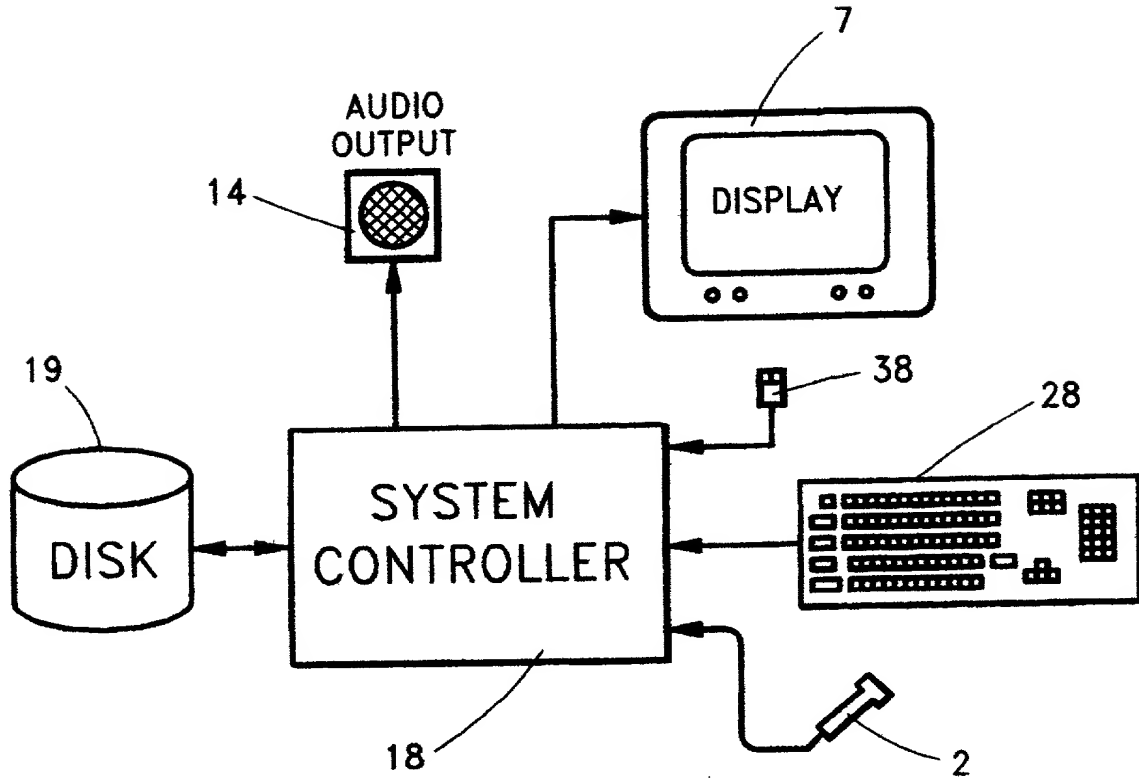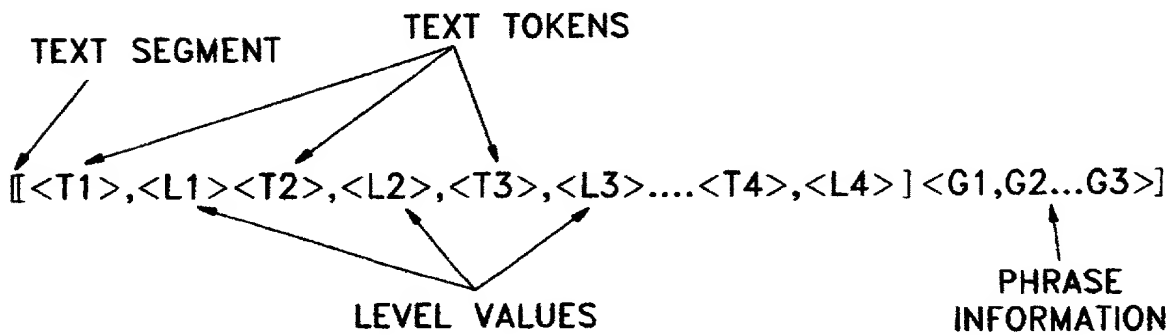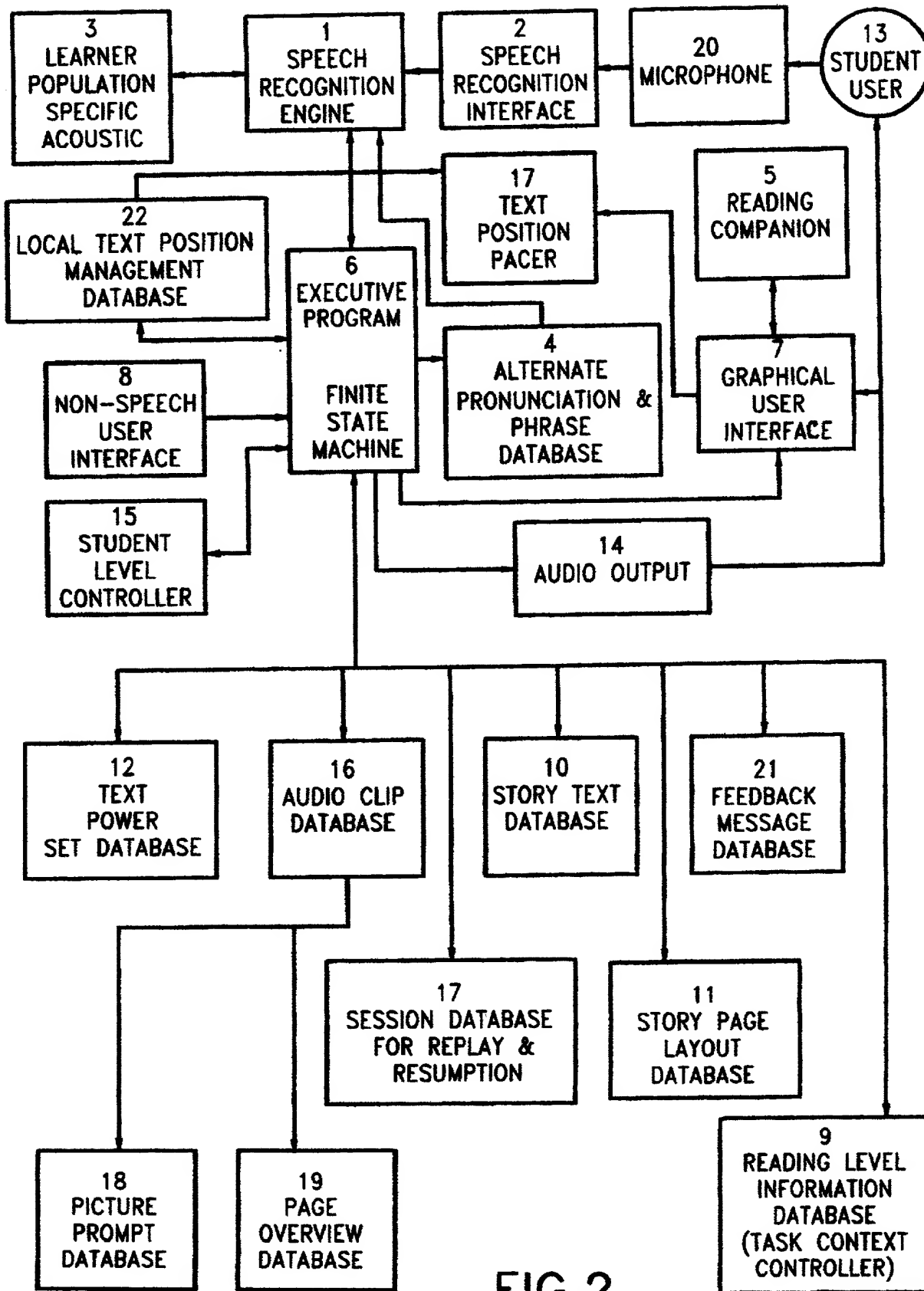YO996-244   — 34 —

AUDIO
OUTPUT

14

7

DISPLAY

38

28

19

DISK

SYSTEM
CONTROLLER

18

2

FIG.1

TEXT SEGMENT

TEXT TOKENS

$[[<T1>,<L1><T2>,<L2>,<T3>,<L3>....<T4>,<L4>]<G1,G2...G3>]$

LEVEL VALUES

PHRASE
INFORMATION

FIG.3

3 LEARNER POPULATION SPECIFIC ACOUSTIC

1 SPEECH RECOGNITION ENGINE

2 SPEECH RECOGNITION INTERFACE

20 MICROPHONE

13 STUDENT USER

22 LOCAL TEXT POSITION MANAGEMENT DATABASE

17 TEXT POSITION PACER

5 READING COMPANION

6 EXECUTIVE PROGRAM FINITE STATE MACHINE

8 NON-SPEECH USER INTERFACE

4 ALTERNATE PRONUNCIATION & PHRASE DATABASE

7 GRAPHICAL USER INTERFACE

15 STUDENT LEVEL CONTROLLER

14 AUDIO OUTPUT

12 TEXT POWER SET DATABASE

16 AUDIO CLIP DATABASE

10 STORY TEXT DATABASE

21 FEEDBACK MESSAGE DATABASE

17 SESSION DATABASE FOR REPLAY & RESUMPTION

11 STORY PAGE LAYOUT DATABASE

18 PICTURE PROMPT DATABASE

19 PAGE OVERVIEW DATABASE

9 READING LEVEL INFORMATION DATABASE (TASK CONTEXT CONTROLLER)

FIG.2

FIG.4A

FIG.4B

GENERATE
FEEDBACK

211

216

INPUT
?

NO

YES

209

STORE
JOINT
PERFORMANCE
INFORMATION

213

GENERATE
CORRECT
RESPONSE

212

IS
INPUT
CORRECT
?

NO

214

LAST
?

NO

YES

215

CONTINUE
?

YES

219

GENERATE PERFORMANCE

217

JOINT
PERFORMANCE
?

YES

NO

NO
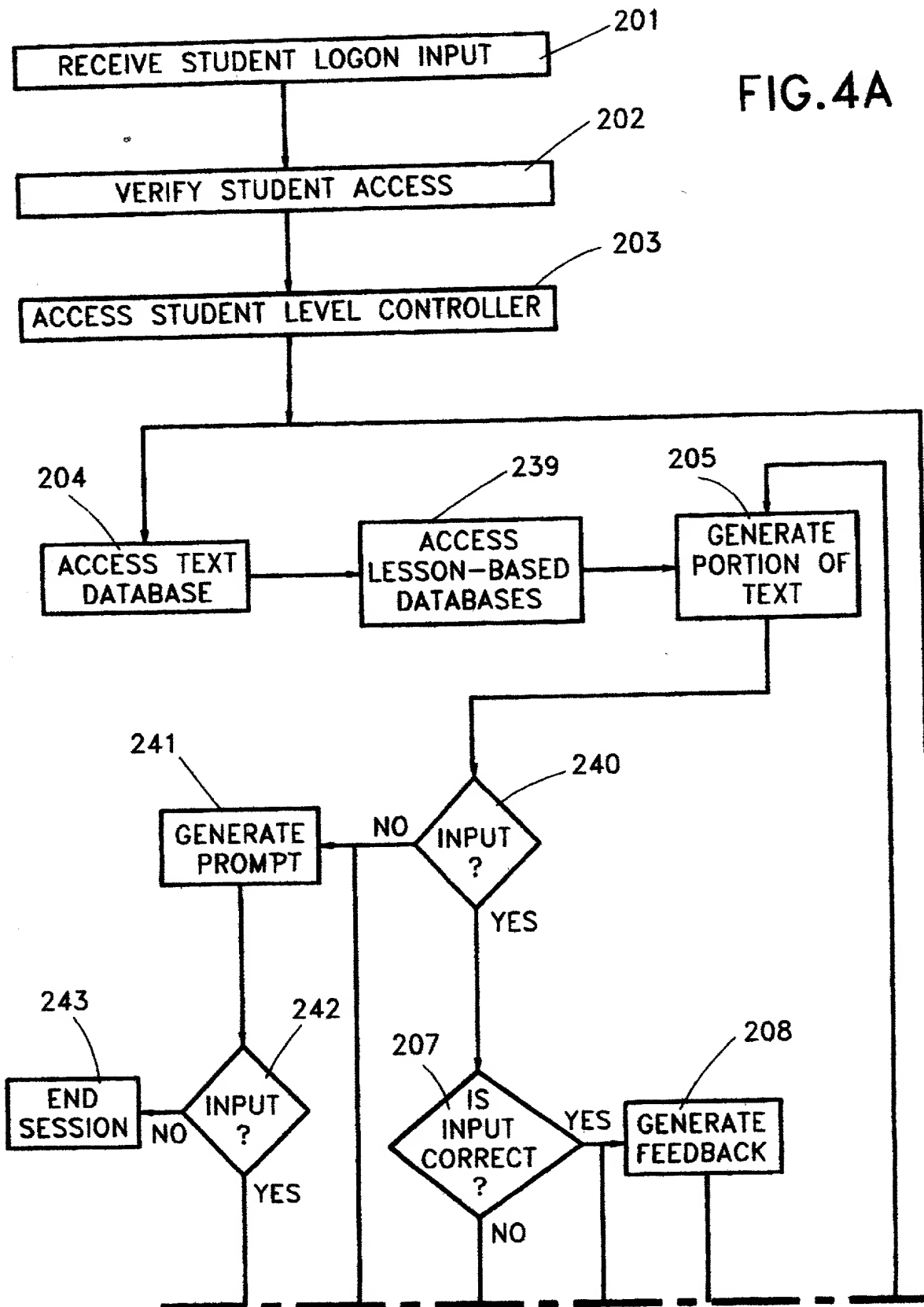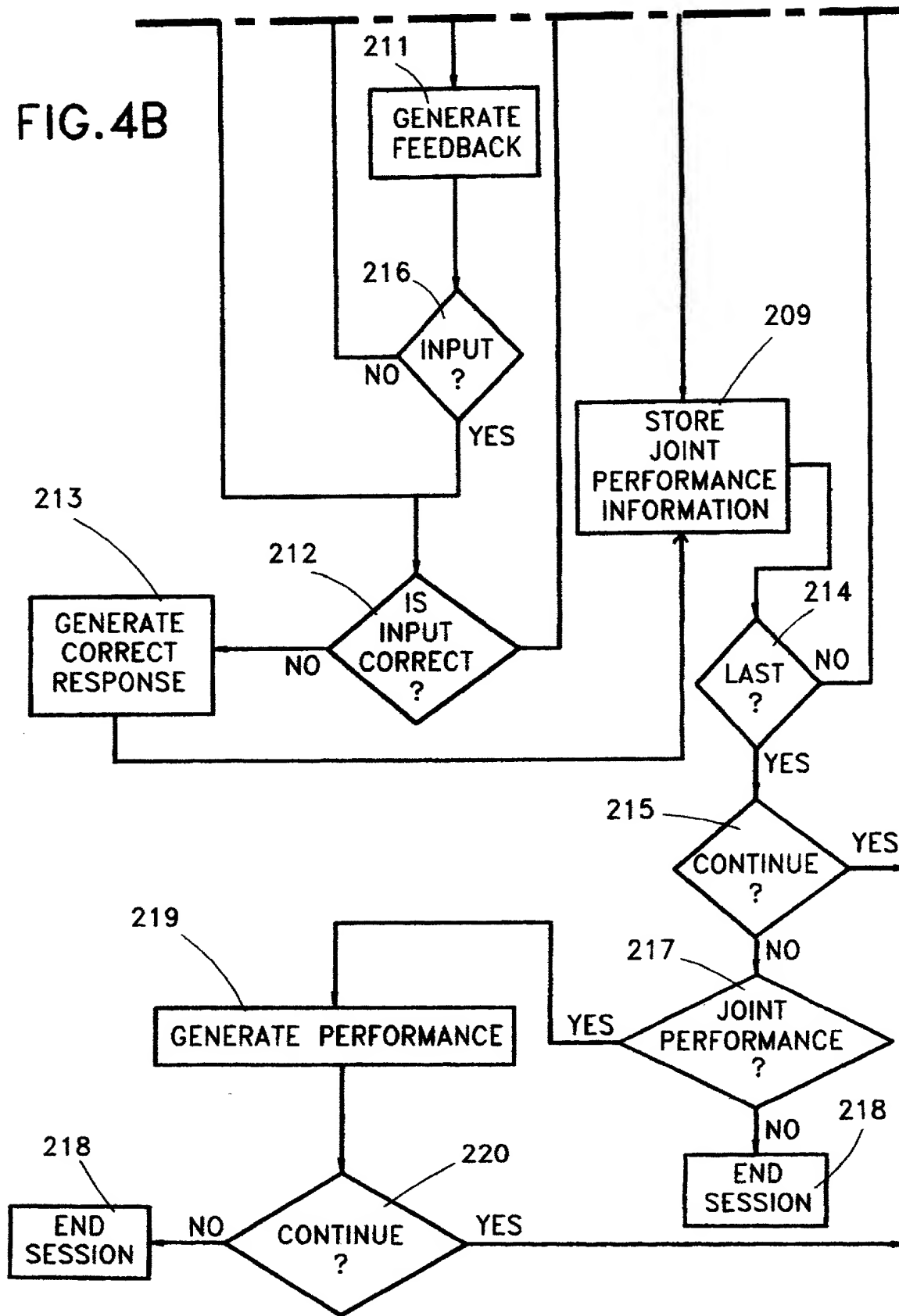
218

END
SESSION

218

END
SESSION

220

CONTINUE
?

NO

YES

DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name;

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled:

SYSTEM AND METHOD FOR INTERACTIVE READING AND LANGUAGE INSTRUCTION

the specification of which (check one)

__X__ is attached hereto.

____ was filed on _____ as United States Application Number _____

or PCT International Application Number _____

and was amended on _____ (if applicable)

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the patentability of this application in accordance with Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, §119(a)-(d) or §365(b) of any foreign application(s) for patent or inventor's certificate, or §365(a) of any PCT International application which designated at least one country other than the United States, listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate, or PCT International application, having a filing date before that of the application on which priority is claimed:

Prior Foreign Application(s)   Priority Claimed

(Number)	(Country)	(Day/Month/Year Filed)	___ Yes ___ No
(Number)	(Country)	(Day/Month/Year Filed)	___ Yes ___ No
(Number)	(Country)	(Day/Month/Year Filed)	___ Yes ___ No

I hereby claim the benefit under 35 U.S.C. §119(e) of any United States provisional application(s) listed below.

| (Application Number) | (Filing Date) |
| (Application Number) | (Filing Date) |

I hereby claim the benefit under 35 U.S.C. §120 of any United States Application(s), or §365(c) of any PCT International application designating the United States, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States, or PCT International application in the manner provided by the first paragraph of 35 U.S.C. §112, I acknowledge the duty to disclose

information material to the patentability of this application as defined in 37 CFR §1.56 which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

| (Application Serial No.) | (Filing Date) | (Status) (patented, pending, abandoned) |
| (Application Serial No.) | (Filing Date) | (Status) (patented, pending, abandoned) |

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that willful false statements may jeopardize the validity of the application or any patent issued thereon.

POWER OF ATTORNEY: As a named inventor I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith (list name and registration number).

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Same as above
Post Office Address

Don Holmes Nix
Full name of fourth joint inventor, if any

[signature]   6-17-97
Inventor's Signature   **Date**

25 Evergreen Way, Sleepy Hollow, New York 10591
Residence

USA
Citizenship

Same as above
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Full name of fifth joint inventor, if any

Inventor's Signature   **Date**

Residence

Citizenship

Post Office Address

Full name of sixth joint-inventor, if any

Inventor's signature   **Date**

Residence

Citizenship

Post Office Address